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Declaration under Rule 4.17:

— of inventorship (Rule 4.17(iv)) for US only

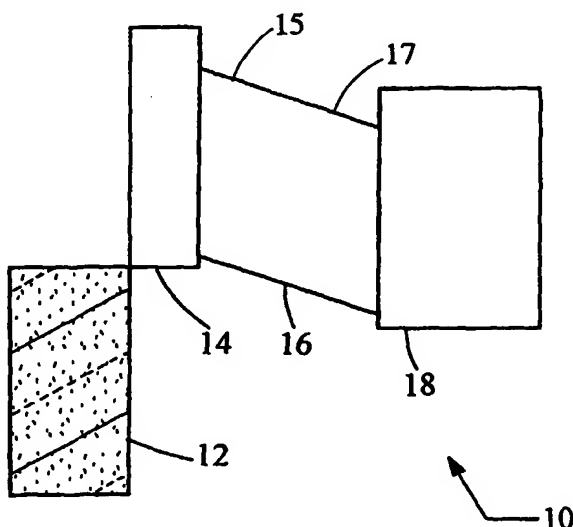
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **ENHANCED PHOTODETECTOR**



(57) **Abstract:** The present invention includes a photodiode (10) having a first p-type semiconductor layer (14) and an n-type semiconductor layer (18) coupled by a second p-type semiconductor layer (16). The second p-type semiconductor layer (16) has graded doping along the path of the carriers. In particular, the doping is concentration graded from a high value (15) near the anode to a lower p concentration (17) towards the cathode (22). By grading the doping in this way, an increase in absorption is achieved, improving the responsivity of the device. Although this doping increases the capacitance relative to an intrinsic semiconductor of the same thickness, the pseudo electric field that is created by the graded doping gives the electrons a very high velocity which more than compensates for this increased capacitance.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/03181

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H01L 31/00, 31/0328, 31/06, 31/075

US CL : 257/184, 185, 189, 191, 439, 461, 463, 655, 656

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 257/184, 185, 189, 191, 439, 461, 463, 655, 656

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
~~searched~~

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EAST; search terms: photodetector, photodiode, graded, doping

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,818,096 A (Ishibashi et al.) 6 Oct. 1998, Fig. 4	1-3
X,P --- Y,P	US 2003/0021322 A1 (Steinle et al.) 30 Jan. 2003, Fig. 5, para. 0051	1-3, 7, 10-12 --- 4-6, 13-15
A	US 4,597,004 A (Longeway et al.) 24 Jun. 1986, Fig. 2	1-19
A	US 4,686,550 A (Capasso et al.) 11 Aug. 1987	1-19
A	US 6,081,019 A (White) 27 Jun. 2000	1-19
A	US 6,107,652 A (Scavennec et al.) 22 Aug. 2000	1-19

☐ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"A" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

17 JULY 2003

Date of mailing of the international search report

05 SEP 2003

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Box No. VIII (iv) : DECLARATION: INVENTORSHIP (only for the purposes of the designation of the United States of America)
The declaration must conform to the following standardized wording provided for in Section 21.4; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (iv). If this Box is not used, this sheet should not be included in the request.

**Declaration of inventorship (Rules 4.17(iv) and 51bis.3(a)(iv))
 for the purposes of the designation of the United States of America:**

I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought.

This declaration is directed to the international application of which it forms a part (if filing declaration with application).

This declaration is directed to international application No. PCT/..... (if furnishing declaration pursuant to Rule 26ter).

I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.

I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications," by application number, country or Member of the World Trade Organization, day, month and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.

Prior Applications:

I hereby acknowledge the duty to disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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☐ This declaration is continued on the following sheet, "Continuation of Box No. VIII (iv)".